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ABSTRACT

The Model of Conceptual Learning and Development (CLD) is an analytical, descriptive model. It defines four levels of concept attainment and the possible uses and extensions of attained concepts, specifies the cognitive operations involved in learning concepts at each of the four levels, and postulates internal and external conditions of learning related to the specified levels. The CLD model provides a basis for assessing children's level of conceptual development. The assessment of the level of conceptual development requires assessment tools and procedures appropriate for children ages 4-18. This working paper presents a set of exercises designed to assess children's level of attainment as well as use of the concept cutting tool. (Author/BJG)

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Development of Conceptual Learning and Development Assessment Series II: Cutting Tool

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Report from the Project on Children's Learning and Development

Wisconsin Research and Development
CENTER FOR COGNITIVE LEARNING

THE UNIVERSITY OF WISCONSIN
Madison, Wisconsin

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Working Paper No. 120

DEVELOPMENT OF CONCEPTUAL LEARNING AND DEVELOPMENT ASSESSMENT SERIES II: CUTTING TOOL

by

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Report from the Project on
Children's Learning and Development

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October 1973

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STATEMENT OF FOCUS

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints--financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

TABLE OF CONTENTS

		Page
I.	Overview of the Conceptual Learning and Development Model	1
II.	Theoretical Framework	3
III.	Procedures and Criteria Used in Developing the Assessment Exercises	13
IV.	Test Battery Instructions	17
V.	Test Battery	37
	References	85

LIST OF FIGURES

Figure		Page
1	Levels of Concept Attainment	6

I

OVERVIEW OF THE CONCEPTUAL LEARNING AND DEVELOPMENT MODEL

This working paper gives an overview of a model of conceptual learning and development (CLD model). The CLD model, in turn, provides the basis for assessing children's level of conceptual development. The assessment of the level of conceptual development requires assessment tools and procedures that may be used with children of about age 4 - 18. The second set of assessment exercises to assess children's level of attainment as well as use of the concept cutting tool is presented in this paper after a brief overview of the CLD model.

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II

THEORETICAL FRAMEWORK

Model of Conceptual Learning and Development (CLD)

The CLD model is based on laboratory and school experiments. The model was formally reported by Klausmeier (1971) and described more fully by Klausmeier, Ghatala, and Frayer (1972). The CLD model is an analytical, descriptive model. It defines four levels of concept attainment and the possible uses and extensions of attained concepts, specifies the cognitive operations involved in learning concepts at each of the four levels, and postulates internal and external conditions of learning related to the specified levels. The levels of concept mastery and the operations and conditions of learning have been identified through behavioral analyses and empirical research in laboratory and school settings. Guidelines for developing instructional materials have also been formulated, based on the model and research in school settings.

A concept is defined as ordered information about the properties of one or more things--objects, events, or processes--that enables any particular thing or class of things to be differentiated from, and also related to, other things or classes of things. The word concept is used by Klausmeier, Ghatala, and Frayer (1972) to designate mental constructs of individuals as well as identifiable public entities that comprise part of the substance of the various disciplines. Thus, the

term concept is used appropriately in two different contexts just as many other English words are.

Concepts as public entities are defined as the organized information corresponding to the meanings of words found in dictionaries, encyclopedias, and other books (Carroll, 1964). Words in a language can be thought of as a series of spoken or written entities. There are meanings for words that can be thought of as a standard of communicative behavior shared by those who speak a language. Finally, there are concepts that are the classes of experiences formed in individuals either independently of language processes or in close dependence on language processes. Putting the three together, Carroll stated: "A 'meaning' of a word is, therefore, a societally standardized concept, and when we say that a word stands for or names a concept it is understood that we are speaking of concepts that are shared among members of a speech community (Carroll, 1964, p. 187)."

When starting a large programmatic research effort dealing with concept learning and instruction, Klausmeier, Davis, Ramsay, Fredrick, and Davies (1965) formulated an idea of concept in terms of defining attributes which they identified as common to many concepts from various disciplines. Klausmeier, Ghatala, and Frayer (1972) carried the definition further by specifying eight attributes of concepts: learnability, usability, validity, generality, power, structure, instance numerousness, and instance perceptibility. Other researchers and subject-matter specialists are also treating concept in terms of defining attributes. For example, Flavell (1970) indicated that a formal definition of concept in terms of its defining attributes is

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useful in specifying what concepts are and what they are not and also in identifying the great variability among concepts. Markle and Tiemann (1969) and Tennyson and Boutwell (1971) have shown that the external conditions of concept learning can be delineated through research that starts with a systematic analysis of the attributes of the particular concepts used in the research.

The CLD model deals with concepts represented by words that can be defined in terms of attributes. It is pointed out that one cannot find definitions for all words which are stated in terms of defining attributes, even in unabridged dictionaries and technical treatises. Therefore, the researcher and the developer of curriculum materials must ascertain the defining attributes independently or cooperatively with scholars from the various disciplines.

Cognitive Operations and Levels of Concept Attainment

Figure 1 schematically presents the "structure" of the model. It shows the four levels at which individuals may attain the same concept, the operations involved at each level, the use and extension of concepts, and the acquisition of names for concepts and their attributes.

Concept levels. A unique feature of the model is that it specifies four levels of attainment of the same concept, rather than postulating attainment at a final level of mastery the first time the concept is learned. The long-term developmental context of the model is thus provided; the model explains the changes that occur in the level of mastery of concepts attained by the same individual across long time intervals.

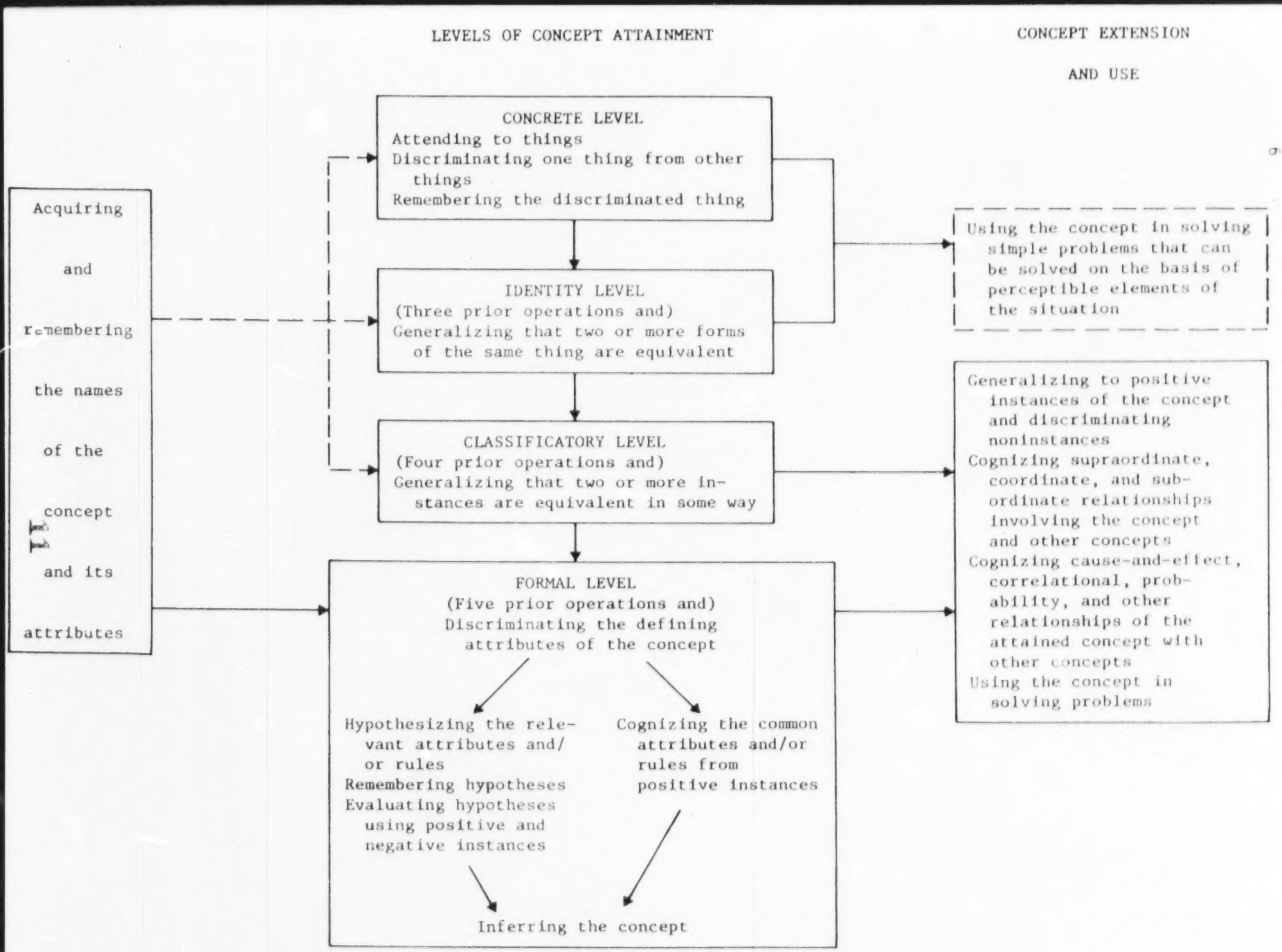
LEVELS OF CONCEPT ATTAINMENT
CONCEPT EXTENSION AND USE
Acquiring and remembering the names of the concept and its attributes
CONCRETE LEVEL
Attending to things
Discriminating one thing from other things
Remembering the discriminated thing
IDENTITY LEVEL
(Three prior operations and)
Generalizing that two or more forms of the same thing are equivalent
CLASSIFICATORY LEVEL
(Four prior operations and)
Generalizing that two or more instances are equivalent in some way
FORMAL LEVEL
(Five prior operations and)
Discriminating the defining attributes of the concept
Hypothesizing the relevant attributes and/or rules
Remembering hypotheses
Evaluating hypotheses using positive and negative instances
Cognizing the common attributes and/or rules from positive instances
Inferring the concept
Using the concept in solving simple problems that can be solved on the basis of perceptible elements of the situation
Generalizing to positive instances of the concept and discriminating noninstances
Cognizing supraordinate, coordinate, and subordinate relationships involving the concept and other concepts
Cognizing cause-and-effect, correlational, probability, and other relationships of the attained concept with other concepts
Using the concept in solving problems

Figure 1. Cognitive operations in concept learning.

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Attainment of a concept at the concrete level is inferred when the individual cognizes an object that he has experienced on a prior occasion. At this level, the object is experienced in exactly the same way on the second and later occasions. Attainment of a concept at the identity level is inferred when the individual cognizes an object as the same one previously encountered when observed from a different spatio-temporal perspective or sensed in a different modality. The attainment of a concept at the classificatory level is inferred when the individual treats at least two instances of the same set of things as equivalent. At this level the individual may be unable to name the attributes that are common to the instances. Attainment of a concept at the formal level is inferred when the individual can name the concept, discriminate and name the societally accepted defining attributes and values, and accurately evaluate instances as belonging or not belonging to the set in terms of the presence or absence of the defining attributes.

Successively attaining each higher level of a concept is postulated to be the normative pattern by which many individuals attain many concepts under two conditions: first, the concept is of the kind for which there are actual perceptible instances or representations of instances; and second, the individual has experiences with the instances starting in early childhood. For example, the individual will have successively formed a concept of tree at the concrete, identity, and classificatory levels before he describes and treats tree and various subclasses of plants formally in terms of their defining attributes. It is recognized that some concepts are not attained at all four of

the successive levels because of the nature of the concepts or because the learning experiences of the individual do not permit their acquisition (Klausmeier, Ghatala, & Frayer, 1972).

Cognitive operations. Figure 1 also indicates the operations involved in attaining each level of a concept. This feature of the model provides the context for explaining short-term learning phenomena and also for identifying the changes that occur across time as new operations emerge and make possible attainment at successively higher levels.

In the CLD model the term operations is used much like Guilford (1967) uses the term, rather than the way Piagetians use it. Guilford defines the operations of cognition, memory, productive thinking and evaluation formally and also operationally in terms of test performances. He states that cognition must be related to the products cognized and defines cognition formally as follows:

> Cognition is awareness, immediate discovery or rediscovery, or recognition of information in various forms; comprehension or understanding. . . . The most general term, awareness, emphasizes having active information at the moment or in the present . . . the term, recognition, is applied to knowing the same particular on a second encounter . . . if cognition is practically instantaneous, call it recognition; if it comes with a slight delay, call it "immediate discovery." [Guilford, 1967, pp. 203-204]

According to Guilford, awareness, recognition, and immediate discovery apply generally to two products at the lower levels in his taxonomy, namely, units of information and classes. On the other hand, comprehension, which Guilford used synonymously with understanding, applies to the higher-level products of relations and systems. Thus,

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cognition of principles, sequences, patterns, or structures involves comprehension, rather than mere awareness, recognition, or immediate discovery.

The first step in attaining a concept at the concrete level is attending to an object and representing it internally (Woodruff, 1961). Gagné (1970) indicates that as the individual attends to an object he discriminates it from other objects. Woodruff (1961) calls the outcome of these attending and discriminating operations a concrete concept, a mental image of some real object experienced directly by the sense organs. The infant, for example, attends to a large red ball and a white plastic bottle, discriminates each one on a nonanalytic perceptual basis, maintains an internal representation of each, and cognizes each of the objects when experienced later.

Whereas the attainment of a concept at the concrete level involves only the discrimination of an object from other objects, attainment at the identity level involves both discriminating various forms of the same object from other objects and also generalizing the forms as equivalent. The new and critical operation is generalizing. For example, the child attaining the identity level of "dog" generalizes that the family poodle is the same poodle when seen from straight ahead, from the side, and from various angles.

The additional operations required for the attainment of a concept at the classificatory level is generalizing that different instances are equivalent in some way. The individual is still at the classificatory level when he correctly classifies a large number of instances as examples and others as nonexamples, but is unable to

describe the basis for his grouping in terms of the defining attributes of the concept. Henley (cited in Deese, 1967), like many other researchers, reported that individuals can group things without being able to describe the basis of the grouping.

Two sets of operations are involved in the learning of concepts at the formal level, as shown in Figure 1. One set of operations includes discriminating and naming the defining attributes (Fredrick & Klausmeier, 1968; Kalish, 1966; Klausmeier & Meinke, 1968; and Lynch, 1966), hypothesizing the atributes that define the concept (Levine, 1963, 1967), remembering hypotheses (Ghatala, 1972; Williams, 1971), evaluating hypotheses (Bruner, Goodnow, & Austin, 1956), and inferring the concept. These operations go beyond those involved in attaining concepts at the classificatory level and occur when the individual infers the defining attributes by using information from positive and negative instances of the concept. The attribute information may be given to the individual verbally or he may secure it by attending to the positive and negative instances.

The second set of operations given in the right column of Figure 1 includes discriminating and naming the defining attributes, cognizing the common attributes and/or rules from only positive instances, and inferring the concept. According to Tagatz (1967), elementary-school children up to about age 12 carry out these operations. They are not able to utilize information well from negative instances or to hypothesize and evaluate the defining attributes.

Concerning memory, Atkinson and Shiffrin (1968) postulate three memory systems--a long-term store, a short-term store, and a sensory

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information register. There is ample evidence that in adults the predominant mode of information storage in both the short- and long-term systems is the verbal-linguistic mode. However, other modes of storage must be possible since adults are able to recognize smells, tastes, and visual stimuli which have not been verbally encoded. Also, a nonlinguistic store is presumed to be essential for preverbal children to learn concrete, identity, and rudimentary class concepts. Bruner (1964) discusses the nonlinguistic features of memory in terms of the enactive and ikonic representation of sensory experiences.

Concept Utilization and Extension

Horizontal transfer is implied by use of the attained concept in recognizing newly encountered examples and nonexamples. Vertical transfer and new learning are presumed to occur as the individual extends his knowledge about an attained concept through using it in understanding various relationships and in solving problems. The individual who has attained a concept at the classificatory or formal level may use it in four ways as shown in Figure 1--in generalizing to new instances, cognizing supraordinate-subordinate relations, cognizing various other relations among concepts, and in generalizing to problem-solving situations. It is not implied that attainment of every concept at the classificatory and formal levels must be followed with all the uses. Little research has been completed regarding any of the uses of attained concepts; however, Ausubel's (1963) constructs of correlative and derivative subsumption are intended to explain how the individual relates concepts to one another. Similarly, Gagné (1970) postulates that having prerequisite concepts is an essential condition of rule learning and problem-solving.

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III

PROCEDURES AND CRITERIA USED IN DEVELOPING THE ASSESSMENT EXERCISES

Procedures for Test Development

A subtest was developed to assess each of the four levels of concept attainment and three of the four uses. Because of the difficulty in devising a test to assess the use of a concept in identifying examples and nonexamples which would be distinct from the test assessing attainment of the classificatory level, this use of concepts was not separately assessed. Therefore, seven subtests were developed. The tests required specially constructed materials.

Criteria for Test Development

To develop the tests of concept attainment and utilization, we analyzed the behaviors involved and then constructed materials and developed instructions to assess the behaviors. The test items went through expert review while under development. The entire battery was then tried out on a small scale before it was used in this study.

A few criteria in addition to the usual ones of reliability, objectivity, and usability, were established to guide the development. First, the materials and instructions had to permit assessment of subjects of preschool age through high school. We hypothesized that not all subjects of preschool age would attain a given concept at the concrete level and that not all high school subjects would attain it at the formal level.

Second, the assessment exercises should be administrable to groups of children rather than to individuals. This decision was based on an earlier set of experimental exercises dealing with equilateral triangle which had been administered on an individual basis. Two weaknesses were found with this series of individually-administered exercises. First, certain items at the formal level of attainment and other items connected with uses of the concept in understanding principles and in cognizing subordinate and superordinate relations called for the subject to give the label equilateral triangle or some other label in response to questioning. Although the experimenter had reasonable assurance that a subject who did not give the label actually did not have the label in his spoken vocabulary, there was not complete certainty regarding this. By using multiple-choice items which gave the correct label as one of the choices, this problem was overcome and at the same time the battery could be administered in groups to children who could read reasonably well. A second limitation of the individually-administered items was that judgments were required for the open-ended scoring responses to many items in addition to those based on having the correct label. This weakness was also eliminated by developing a paper and pencil battery.

The third criterion for the selection of the concept was that it had to have perceptible instances or representations thereof. An instance of the concept or a representation of it was needed to test for attainment at the concrete, identity, and classificatory levels.

The fourth selection criterion was that the concept had to be definable by publicly accepted attributes in order to test attainment

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at the formal level. In this connection we noted earlier that many concepts are definable in terms of attributes even though this method of definition is often not used in abridged dictionaries.

Fifth, the concept selected for a battery should be relatable to the subject matter which children encounter in school. This is in line with our proposition that directed experience, including instruction in school, is a powerful determininant of the particular concepts attained by individuals and also of their level of attainment and use. Further, since much instruction in school deals with concepts, our model should have applicability to the design of instruction, and the subtests should be usuable, when fully validated, in assessing the level of conceptual development in school-age children.

Sixth, the particular concept had to be part of a taxonomy in order to test its use in cognizing supraordinate-subordinate relationships.

Finally, the concept had to be usuable in cognizing principles and in problem solving. Here, the concept may be usable in solving simple problems without being used first in understanding a principle, or it may be used first in understanding a principle and then in solving more complex problems.

The concept cutting tool met many of these criteria and was selected for the second battery of tests to be developed and administered.

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IV

TEST BATTERY INSTRUCTIONS

I-Introduction

The purpose of the Concept Development battery is to assess the level of concept attainment the child has achieved. These instruments are based on the model of conceptual learning and development proposed by H. J. Klausmeier. The battery is intended for use from kindergarten through twelfth grade. However, it may not be necessary or desirable to administer all items or subtests at each grade level.

It is generally assumed that (1) intermediate aged children respond correctly to all items in booklet A; and (2) primary aged children respond incorrectly to certain items in booklets C and D. Therefore, it may be unnecessary to administer part or all of certain booklets to all age levels. It is also necessary to recognize that when younger children are not administered all items, it becomes impossible for them to show full mastery of certain levels. The number of items administered or not administered should be determined in light of the goals of the particular research study.

The battery is administered to intact classroom groups at the higher primary level and above, and to smaller groups of 5 to 7 children at the lower primary level.

The entire battery is read to students regardless of their grade level. Therefore, it is essential that all students be working on the question being read by the administrator. Students mark their answers directly on the test pages so no separate answer sheet is required. Children should

not be allowed to change answers on subtests already taken. All materials needed for testing sessions are listed below:

Materials the student will need:

1. Concept Development Battery
2. Cleared desk top or space to work
3. Pencil

Materials the test administrator will need:

1. Test administrator's manual
2. Copy of the test booklets for demonstration
3. Extra pencils
4. A "Testing: DO NOT DISTURB" sign for the door

Since all directions given orally must be read word for word, it is important that the test administrator study the directions in each manual prior to testing. Familiarity with test directions is enhanced by working with a copy of the test in hand. Directions to the test administrator are in small letters and enclosed in parentheses. Directions to be read to children are in capital letters. In some instances, instructions differ among various forms of the battery being administered; in such cases, the differing instructions will be enclosed in asterisks and labeled appropriately.

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II - Directions for Administering the Battery

(Distribute test booklets and pencils to the students. The booklets should be passed out and collected separately for each section of the Battery--IIA, IIB, IIC, IID.)

Directions for Booklet IIA (Items 1-16)

(For Kindergarten enter the requested identification information. Direct older students to fill in the name section.) DO NOT TURN THE PAGE UNTIL I TELL YOU TO. ON THE TOP OF THE PAGE FILL IN YOUR NAME, YOUR BIRTHDATE, YOUR SCHOOL'S NAME, YOUR GRADE, AND TODAY'S DATE. TODAY'S DATE IS _____. (Write today's date on the blackboard.) YOU ARE GOING TO BE ASKED QUESTIONS ABOUT THE WAYS IN WHICH THINGS ARE ALIKE, OR THE WAYS IN WHICH THINGS ARE DIFFERENT. THE QUESTIONS ARE NOT ABOUT YOUR SCHOOL WORK, AND YOU WILL NOT RECEIVE A GRADE. YOU MAY FIND SOME OF THE QUESTIONS EASY. OTHERS MAY BE VERY DIFFICULT BECAUSE YOU MAY NOT HAVE LEARNED ABOUT THESE THINGS YET. PLEASE FOLLOW THE DIRECTIONS I GIVE YOU VERY CAREFULLY AND TRY TO DO YOUR BEST ON EACH QUESTION. IN THIS BOOKLET YOU WILL LOOK AT A DRAWING AND THEN FIND ONE THAT LOOKS THE SAME IN A GROUP OF DRAWINGS ON THE NEXT PAGE. OPEN YOUR BOOKLET TO PAGE 1. (Demonstrate. Check to see if each child's booklet is open to page 1.)

LOOK CAREFULLY AT THE DRAWING ON THIS PAGE. (Pause.) NOW TURN TO PAGE 2. THERE IS AN "X" ON THE DRAWING THAT LOOKS THE SAME AS THE ONE YOU JUST SAW. (Pause.)

****

Primary Instructions for Example Items-Booklet IIA

NOW LET'S DO ANOTHER EXAMPLE, BUT THIS TIME YOU WILL MARK THE "X" ON THE CORRECT DRAWING YOURSELF. TURN TO PAGE 3 AND LOOK CAREFULLY AT THE DRAWING. (Demonstrate. Check to see that each child's booklet is open to this page.)

NOW TURN TO PAGE 4 AND MARK AN "X" ON THE DRAWING THAT LOOKS THE SAME AS THE ONE YOU SAW ON PAGE 3. DO NOT LOOK BACK. (Pause.)

YOU SHOULD HAVE MARKED AN "X" ON THIS DRAWING. (Point to second drawing from left.) DO YOU HAVE ANY QUESTIONS ABOUT WHAT TO DO? (Pause.) THE REST OF THE QUESTIONS IN THIS BOOKLET WILL BE LIKE THE ONES YOU JUST DID. FIRST YOU WILL LOOK CAREFULLY AT A DRAWING ON A PAGE. THEN YOU WILL MARK AN "X" ON THE DRAWING THAT LOOKS THE SAME ON THE NEXT PAGE. WHEN YOU'RE NOT SURE OF AN ANSWER, MARK THE ANSWER YOU THINK IS RIGHT. DON'T WORK AHEAD AND DON'T SAY ANYTHING OUT LOUD. WHEN YOU WANT TO CHANGE AN ANSWER, ERASE THE FIRST "X" YOU MADE. THEN MARK AN "X" ON THE DRAWING YOU THINK IS RIGHT. YOU MUST NOT LOOK BACK AFTER YOU HAVE BEEN TOLD TO TURN A PAGE. READY? (Note: For every item, the test administrator should check to see that each child is on the correct page.)

****

Intermediate Instructions for Example Items-Booklet IIA

ANOTHER EXAMPLE IS GIVEN ON THE NEXT PAGE BUT THIS TIME YOU WILL NEED TO MARK THE "X" ON THE CORRECT DRAWING YOURSELF. LOOK AT THE DRAWING ON PAGE 3. (Pause.)

NOW TURN TO PAGE 4 AND MARK AN "X" ON THE DRAWING THAT LOOKS THE SAME AS THE ONE YOU SAW ON PAGE 3. DO NOT LOOK BACK. (Pause.)

YOU SHOULD HAVE MARKED AN "X" ON THE SECOND DRAWING FROM THE LEFT. ARE THERE ANY QUESTIONS? (Pause.) THE REST OF THE BOOKLET WILL BE LIKE THE EXAMPLES YOU JUST DID. YOU WILL STUDY ONE DRAWING THEN MARK THE DRAWING THAT LOOKS THE SAME ON THE NEXT PAGE. DO NOT LOOK BACK AFTER YOU HAVE BEEN TOLD TO TURN A PAGE. IF YOU WISH TO CHANGE AN ANSWER, BE SURE TO ERASE YOUR FIRST "X" COMPLETELY.

****

TURN TO PAGE 5 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 6.

MARK THE DRAWING THAT LOOKS THE SAME AS THE ONE YOU JUST SAW. DO NOT LOOK BACK. (Pause.)

TURN TO PAGE 7 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 8.

MARK THE DRAWING THAT LOOKS THE SAME AS THE ONE YOU JUST SAW. DO NOT LOOK BACK. (Pause.)

TURN TO PAGE 9 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 10.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 11 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 12.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 13 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 14.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 15 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 16.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 17 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 18.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 19 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 20.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 21 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 22.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 23 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 24.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 25 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 26.

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MARK THE DRAWING. (Pause.)

TURN TO PAGE 27 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 28.

MARK THE DRAWING. (Pause.)

TURN TO PAGE 29 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 30.

MARK THE DRAWING THAT LOOKS THE SAME. (Pause.)

TURN TO PAGE 31 AND LOOK AT THE DRAWING. (Pause.) TURN TO PAGE 32.

MARK THE DRAWING THAT LOOKS THE SAME. (Pause.)

THAT IS THE LAST QUESTION IN THIS BOOKLET. (Collect booklets.)

Directions for Booklet IIB

(Distribute test booklets and pencils to each student. For Kindergarten enter the requested identification information. Direct older students to complete the identification information.)

IN THIS BOOKLET ARE MORE QUESTIONS ABOUT THE WAYS IN WHICH THINGS ARE SIMILAR OR DIFFERENT. YOU WILL MARK YOUR ANSWERS IN THE SAME WAY, BY MAKING AN "X" ON THE DRAWING YOU CHOOSE. WHEN YOU'RE NOT SURE OF AN ANSWER, MARK THE ANSWER YOU THINK IS RIGHT. WHEN YOU WANT TO CHANGE AN ANSWER, ERASE THE FIRST "X" YOU MADE THEN MARK AN "X" ON THE DRAWING YOU THINK IS RIGHT. OPEN YOUR BOOKLET TO PAGE 1. (Demonstrate.)

(Note for Kindergarten: for examples A and B and questions 1-2 substitute "over here" for both "(on the right)" and "(on the left)." Using a test booklet, demonstrate the stimulus and item response positions referred to by "over here.")

IN THIS SECTION YOU ARE TO MARK A THING (ON THE RIGHT) THAT IS LIKE THE THING (ON THE LEFT) IN SOME WAY. ON THIS PAGE IS AN EXAMPLE THAT HAS ALREADY BEEN MARKED. LISTEN CAREFULLY WHILE I READ THE DIRECTIONS. EXAMPLE A SAYS " THE THING (ON THE LEFT) IS USED TO DO CERTAIN KINDS OF WORK. PUT AN "X" ON THE THING (ON THE RIGHT) THAT IS USED TO DO THE SAME KIND OF WORK AS THE THING (ON THE LEFT)." THE THING (ON THE LEFT) IS USED TO POUND NAILS INTO WOOD. THERE IS AN "X" ON THE THING (ON THE RIGHT) THAT ALSO IS USED TO POUND NAILS INTO WOOD.

NOW WE WILL DO ANOTHER EXAMPLE, BUT THIS TIME YOU WILL MARK THE ANSWER. TURN TO PAGE 2.

LISTEN CAREFULLY WHILE I READ THE DIRECTIONS. EXAMPLE B SAYS "THE THING (ON THE LEFT) IS USED TO DO CERTAIN KINDS OF WORK. PUT AN "X" ON THE THING (ON THE RIGHT) THAT IS USED TO DO THE SAME KIND OF WORK AS THE THING (ON THE LEFT)." (Repeat sentences. Pause.) THE THING (ON THE LEFT) IS USED TO MEASURE LENGTHS AND DISTANCES. YOU SHOULD HAVE PUT AN "X" ON THE LAST THING IN THE BOTTOM ROW (Point to last drawing in bottom row.) BECAUSE IT IS ALSO USED TO MEASURE LENGTHS AND DISTANCES. ARE THERE ANY QUESTIONS ABOUT WHAT TO DO? (Go back over examples A and B if there are questions.) TURN TO PAGE 3.

(When administering a primary version of the test read each question aloud twice. When administering an intermediate version read each question aloud once. Pace all students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

PROBLEM 1. THE THING ON THE LEFT IS USED TO DO CERTAIN KINDS OF WORK. PUT AN X ON THE THING ON THE RIGHT THAT IS USED TO DO THE SAME KIND OF WORK AS THE THING ON THE LEFT.

MARK YOUR ANSWER AND TURN TO PAGE 4.

BEST COPY AVAILABLE

PROBLEM 2. THE THING ON THE LEFT IS USED TO DO CERTAIN KINDS OF WORK. PUT AN X ON THE THING ON THE RIGHT THAT IS USED TO DO THE SAME KIND OF WORK AS THE THING ON THE LEFT.

MARK YOUR ANSWER AND TURN TO PAGE 5.

IN THE FOLLOWING PROBLEMS THERE WILL ALWAYS BE MORE THAN ONE DRAWING TO MARK. LOOK CAREFULLY AT EACH THING BELOW BEFORE YOU MARK YOUR ANSWERS. REMEMBER THAT YOU WILL PUT AN "X" ON MORE THAN ONE THING.

PROBLEM 3. LOOK CAREFULLY AT EACH THING BELOW. PUT AN X ON THE THINGS BELOW THAT ARE USED TO DO THE SAME KIND OF WORK.

MARK YOUR ANSWER AND TURN TO PAGE 6.

PROBLEM 4. LOOK CAREFULLY AT EACH THING BELOW. PUT AN X ON THE THINGS BELOW THAT ARE USED TO DO THE SAME KIND OF WORK.

MARK YOUR ANSWER AND TURN TO PAGE 7.

PROBLEM 5. LOOK CAREFULLY AT EACH THING BELOW. PUT AN X ON THE THINGS BELOW THAT ARE USED TO DO THE SAME KIND OR WORK.

MARK YOUR ANSWER AND TURN TO PAGE 8.

****

Pages 8-17 Primary Instructions for Kindergarten

NOW YOU WILL ANSWER QUESTIONS THAT ARE DIFFERENT FROM BEFORE. I AM GOING TO READ THIS QUESTION (Point.) ABOUT THE THINGS AT THE TOP OF THE PAGE. (Point.) I WILL ALSO READ FOUR DIFFERENT ANSWERS TO THE QUESTION. (Point to each answer choice and indicate that a is one answer, b is another answer, etc., through d.) ONLY ONE OF THESE FOUR DIFFERENT ANSWERS IS RIGHT. YOU ARE TO MARK AN "X" ON THE ONLY ONE OF THESE LETTERS, A, B, C, or D. WHEN YOU DON'T KNOW THE ANSWER, YOU CAN MARK AN "X" ON D, WHICH SAYS "I DON'T KNOW." DO YOU UNDERSTAND WHAT YOU ARE TO DO? (Repeat the above procedure if necessary. Read aloud questions 6-15 and their answer choices twice. Point to each answer choice as you read it aloud. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

****

Pages 8-17 Primary Instructions for Third Grade

NOW YOU WILL ANSWER QUESTIONS THAT ARE DIFFERENT FROM BEFORE. I WILL READ THE QUESTION THAT ASKS ABOUT THE THINGS AT THE TOP OF THE PAGE. I WILL ALSO READ THE FOUR DIFFERENT ANSWER CHOICES FOR THE QUESTION--ANSWER CHOICES A, B, C, AND D. ONLY ONE OF THESE ANSWERS IS CORRECT. YOU ARE TO MARK AN "X" ON THE LETTER OF THE ANSWER CHOICE THAT YOU THINK IS RIGHT. WHEN YOU DON'T KNOW THE ANSWER, YOU CAN MARK D, WHICH SAYS "I DON'T KNOW." YOU MAY READ ALONG SILENTLY AS I READ OUT LOUD. READY? (Read aloud question 6-15 and their answer choices twice. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

****

Pages 8-17 Intermediate Instructions

THIS SECTION DEALS WITH THE WAYS THAT A THING CAN BE PUT INTO MORE THAN ONE GROUP. FOR EACH PROBLEM YOU WILL SEE A GROUP OF THINGS AND A QUESTION ABOUT THESE THINGS. YOU ARE TO SELECT THE CORRECT ANSWER TO THE QUESTION. MARK AN "X" ON THE LETTER THAT IDENTIFIES THE CORRECT ANSWER. FOR SOME OF THE QUESTIONS YOU MAY NOT KNOW THE CORRECT ANSWER. IF NOT, MARK THE LETTER BY "I DON'T KNOW." (Read aloud questions 6-15 and their answer choices. Read each item once. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see if all students are on the right page.)

****

PROBLEM 6. LOOK AT THE THINGS ABOVE. DO THEY ALL HAVE A BLADE THAT IS SMOOTH?

A. YES, ALL OF THEM HAVE A BLADE THAT IS SMOOTH.

B. NO, ONLY SOME OF THEM HAVE A BLADE THAT IS SMOOTH.

C. NO, NONE OF THEM HAVE A BLADE THAT IS SMOOTH.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 9.

PROBLEM 7. LOOK AT THE THINGS ABOVE THAT HAVE A BLADE THAT IS SMOOTH. ARE THEY ALL CUTTING TOOLS?

A. YES, ALL OF THEM ARE CUTTING TOOLS.

B. NO, ONLY SOME OF THEM ARE CUTTING TOOLS.

C. NO, NONE OF THEM ARE CUTTING TOOLS.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 10.

BEST COPY AVAILABLE

PROBLEM 8. LOOK AT THE THINGS ABOVE. DO THEY ALL HAVE A BLADE THAT HAS TEETH?

A. YES, ALL OF THEM HAVE A BLADE THAT HAS TEETH.

B. NO, NONE OF THEM HAVE A BLADE THAT HAS TEETH.

C. NO, ONLY SOME OF THEM HAVE A BLADE THAT HAS TEETH.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 11.

PROBLEM 9. LOOK AT THE THINGS ABOVE. ARE THEY ALL THINGS THAT CUT?

A. NO, ONLY SOME OF THEM CUT.

B. YES, ALL OF THEM CUT.

C. NO, NONE OF THEM CUT.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 12.

PROBLEM 10. LOOK AT THE LARGE THINGS ABOVE. DO THEY ALL HAVE A BLADE THAT IS SMOOTH?

A. YES, ALL OF THEM HAVE A BLADE THAT IS SMOOTH.

B. NO, ONLY SOME OF THEM HAVE A BLADE THAT IS SMOOTH.

C. NO, NONE OF THEM HAVE A BLADE THAT IS SMOOTH.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 13.

PROBLEM 11. LOOK AT ALL THE THINGS ABOVE THAT HAVE A BLADE THAT IS SMOOTH AND ALL THE THINGS THAT HAVE A BLADE THAT HAS TEETH. IF YOU PUT THEM ALL IN A GROUP, THERE WOULD BE _____ THERE ARE CUTTING TOOLS.

A. FEWER OF THEM THAN

B. MORE OF THEM THAN

C. THE SAME AMOUNT OF THEM AS

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 14.

PROBLEM 12. LOOK AT THE THINGS ABOVE THAT HAVE A BLADE THAT HAS TEETH. ARE THEY ALL CUTTING TOOLS?

A. YES, ALL OF THEM ARE CUTTING TOOLS.

B. NO, ONLY SOME OF THEM ARE CUTTING TOOLS.

C. NO, NONE OF THEM ARE CUTTING TOOLS.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 15.

PROBLEM 13. LOOK AT THE THINGS ABOVE THAT CUT. ARE THEY ALL TOOLS?

A. YES, ALL OF THEM ARE TOOLS.

B. NO, ONLY SOME OF THEM ARE TOOLS.

C. NO, NONE OF THEM ARE TOOLS.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 16.

PROBLEM 14. LOOK AT THE THINGS ABOVE THAT HAVE A BLACK HANDLE. DO ALL OF THEM HAVE A BLADE THAT HAS TEETH?

A. YES, ALL OF THEM HAVE A BLADE THAT HAS TEETH.

B. NO, ONLY SOME OF THEM HAVE A BLADE THAT HAS TEETH.

C. NO, NONE OF THEM HAVE A BLADE THAT HAS TEETH.

OR

D. I DON'T KNOW.

MARK YOUR ANSWER AND TURN TO PAGE 17.

PROBLEM 15. LOOK AT ALL OF THE THINGS ABOVE THAT CUT AND ALL OF THE THINGS THAT DO NOT CUT. IF YOU PUT THEM ALL IN A GROUP, THERE WOULD BE _____ THERE ARE TOOLS.

A. FEWER OF THEM THAN

B. MORE OF THEM THAN

C. THE SAME AMOUNT OF THEM AS

OR

D. I DON'T KNOW.

THIS IS THE LAST PROBLEM IN THIS BOOKLET. (Collect booklets.)

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Directions for Booklet IIC

(Distribute test booklets and pencils to students. For Kindergarteners enter the requested identification information. Direct older students to complete the identification information.)

****

Kindergarten Instructions for Booklet IIC

TURN TO PAGE 1. IN THIS BOOKLET YOU ARE TO SOLVE PROBLEMS ABOUT THE THINGS THAT ARE PICTURED. WE WILL DO EACH QUESTION AS WE DID BEFORE. I WILL READ EACH QUESTION AND THE DIFFERENT ANSWERS. YOU ARE TO MARK AN "X" ON THE LETTER OF THE ANSWER CHOICE THAT YOU THINK IS RIGHT. WHEN YOU DON'T KNOW THE ANSWER, MARK CHOICE E, "I DON'T KNOW." READY? (Using a test booklet, read aloud each question and their answer choice. Read each choice twice. Pace students through the items. Wait until all students have completed as item before proceeding to the next item. Check to see that all students are on the right page. Point to each answer choice as you read it aloud.)

****

Third Grade Instructions for Booklet IIC

TURN TO PAGE 1. IN THIS BOOKLET YOU ARE TO SOLVE PROBLEMS ABOUT THE THINGS THAT ARE PICTURED. WE WILL DO EACH QUESTION AS WE DID BEFORE. I WILL READ EACH QUESTION AND THE DIFFERENT ANSWERS. YOU ARE TO MARK AN "X" ON THE LETTER OF THE ANSWER CHOICE THAT YOU THINK IS RIGHT. WHEN YOU DON'T KNOW THE ANSWER, MARK CHOICE E, "I DON'T KNOW." READY?

(Read aloud questions 1-15. Read each item and the answer choices twice. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

****

Intermediate Instructions for Booklet IIC

TURN TO PAGE 1. IN THIS BOOKLET YOU ARE TO SOLVE PROBLEMS ABOUT THE THINGS THAT ARE PICTURED. WE WILL DO EACH QUESTION AS WE DID BEFORE. I WILL READ EACH QUESTION AND THE DIFFERENT ANSWERS. YOU ARE TO MARK AN "X" ON THE LETTER OF THE ANSWER CHOICE THAT YOU THINK IS RIGHT. WHEN YOU DON'T KNOW THE ANSWER, MARK CHOICE E, "I DON'T KNOW." READY?

(Read aloud questions 1-15. Read each item and the answer choices once. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

****

PROBLEM 1. KNIFE X, KNIFE Y, AND KNIFE Z HAVE SHARP BLADES. IMAGINE THAT KNIFE X IS THREE INCHES LONG AND CAN ONLY WITHSTAND A SMALL AMOUNT OF IMPACT. IMAGINE THAT KNIFE Y IS SIX INCHES LONG AND CAN WITHSTAND A LARGE AMOUNT OF IMPACT. IMAGINE THAT KNIFE Z IS SIX INCHES LONG AND CAN WITHSTAND ONLY A SMALL AMOUNT OF IMPACT.

WHICH KNIFE SHOULD BE USED TO CUT THROUGH A PIECE OF HARD WOOD IF YOU WANT TO USE A KNIFE THAT WILL NOT BREAK?

A. KNIFE X

B. KNIFE Y

C. KNIFE Z

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 2.

PROBLEM 2. IMAGINE THAT SAW X HAS A SHARP BLADE AND IS EIGHT INCHES LONG. IMAGINE THAT SAW Y HAS A SHARP BLADE AND IS TWELVE INCHES LONG. IMAGINE THAT SAW Z HAS A SHARP BLADE AND IS SIXTEEN INCHES LONG.

WHAT SAW SHOULD BE USED TO CUT THROUGH THE LARGE PIECE OF WOOD MOST QUICKLY?

A. SAW X

B. SAW Y

C. SAW Z

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 3.

BEST COPY AVAILABLE

PROBLEM 3. SCISSOR X, SCISSOR Y, AND SCISSOR Z HAVE SHARP BLADES. IMAGINE THAT SCISSOR X IS FOUR INCHES LONG AND HAS A HIGH DEGREE OF HARDNESS. IMAGINE THAT SCISSOR Y IS FIVE INCHES LONG AND HAS A LOW DEGREE OF HARDNESS. IMAGINE THAT SCISSOR Z IS SIX INCHES LONG AND HAS A LOW DEGREE OF HARDNESS.

WHICH SCISSOR SHOULD BE USED IF YOU WANT A SCISSOR THAT WILL STAY SHARP WHEN CUTTING MANY PIECES OF TOUGH CLOTH OR MATERIAL?

A. SCISSOR X

B. SCISSOR Y

C. SCISSOR Z

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 4.

PROBLEM 4. SAW X, SAW Y, AND SAW Z ARE EXACTLY ALIKE IN SIZE AND SHARPNESS. SAW X WAS TEMPERED AT 430 DEGREES, SAW Y AT 520 DEGREES, AND SAW Z AT 610 DEGREES.

WHICH SAW SHOULD BE USED IF YOU WANT A SAW THAT WILL NOT BREAK WHEN CUTTING THROUGH MANY PIECES OF HARD WOOD?

A. SAW X

B. SAW Y

C. SAW Z

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 5.

PROBLEM 5. IMAGINE THAT KNIFE X HAS A DULL BLADE AND IS FOUR INCHES LONG. IMAGINE THAT KNIFE Y HAS A SHARP BLADE AND IS SIX INCHES LONG. IMAGINE THAT KNIFE Z HAS A DULL BLADE AND IS EIGHT INCHES LONG.

WHICH KNIFE SHOULD BE USED TO CUT THROUGH THE PIECE OF MEAT MOST QUICKLY?

A. KNIFE X

B. KNIFE Y

C. KNIFE Z

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 6.

PROBLEM 6. SAW X CAN WITHSTAND A LARGER AMOUNT OF IMPACT THAN CAN SAW Y. WHEN CUTTING THE HARD PIECE OF WOOD, SAW X WILL BREAK _____ SAW Y.

A. MORE QUICKLY THAN

B. AS QUICKLY AS

C. LESS QUICKLY THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 7.

PROBLEM 7. KNIFE X IS LARGER THAN KNIFE Y. KNIFE X AND KNIFE Y HAVE EQUALLY SHARP BLADES. KNIFE X WILL CUT THROUGH A LARGE PIECE OF MEAT _____ KNIFE Y.

A. MORE QUICKLY THAN

B. LESS QUICKLY THAN

C. AS QUICKLY AS

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 8.

PROBLEM 8. KNIFE X AND KNIFE Y ARE EQUALLY SHARP. KNIFE X WAS HEATED TO A HIGHER TEMPERING TEMPERATURE THAN WAS KNIFE Y. WHEN CUTTING THE HARD PIECE OF WOOD, KNIFE X IS _____ KNIFE Y.

A. LESS LIKELY TO BREAK THAN

B. EQUALLY LIKELY TO BREAK AS

C. MORE LIKELY TO BREAK THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 9.

BEST COPY AVAILABLE

PROBLEM 9. THE BLADE OF KNIFE X IS HARD AND SHARP. THE BLADE OF KNIFE Y IS HARD AND DULL. KNIFE X WILL CUT THROUGH A PIECE OF MEAT _____ KNIFE Y.

A. AS QUICKLY AS

B. MORE QUICKLY THAN

C. LESS QUICKLY THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 10.

PROBLEM 10. BOTH SAW X AND SAW Y HAVE SHARP BLADES. THE BLADE OF SAW X IS MUCH HARDER THAN IS THE BLADE OF SAW X IS MUCH HARDER THAN IS THE BLADE OF SAW Y. WHEN CUTTING THROUGH MANY PIECES OF HARD WOOD, SAW X WILL _____ SAW Y.

A. BECOME DULLER OVER A LONGER PERIOD OF USE THAN

B. REMAIN AS SHARP OVER A LONGER PERIOD OF USE AS

C. REMAIN SHARPER OVER A LONGER PERIOD OF USE THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 11.

PROBLEM 11. A CUTTING TOOL BLADE THAT CAN WITHSTAND A LARGE AMOUNT OF IMPACT IS _____ A CUTTING TOOL BLADE THAT CANNOT WITHSTAND A LARGE AMOUNT OF IMPACT.

A. AS LIKELY TO BREAK AS

B. LESS LIKELY TO BREAK THAN

C. MORE LIKELY TO BREAK THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 12.

PROBLEM 12. A SHARP CUTTING TOOL BLADE CUTS _____ A DULL CUTTING TOOL BLADE.

A. LESS QUICKLY THAN

B. MORE QUICKLY THAN

C. AS QUICKLY AS

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 13.

PROBLEM 13. A LARGE KIND OF CUTTING TOOL ACCOMPLISHES _____ A SMALL CUTTING TOOL OF THE SAME KIND.

A. A LESSER AMOUNT OF CUTTING THAN

B. THE SAME AMOUNT OF CUTTING AS

C. A GREATER AMOUNT OF CUTTING THAN

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING THEM OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 14.

PROBLEM 14. A CUTTING TOOL BLADE WHEN HEATED TO A HIGH TEMPERING TEMPERATURE WILL _____.

A. BE QUITE LIKELY TO BREAK

B. HAVE A SHARP BLADE.

C. BE LIKELY NOT TO BREAK

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING IT OUT.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 15.

PROBLEM 15. A SHARP CUTTING TOOL BLADE THAT HAS A HIGH DEGREE OF HARDNESS _____.

A. BECOMES QUITE DULL OVER A LONG PERIOD OF USE

B. REMAINS SHARP OVER A LONG PERIOD OF USE

C. BECOMES SHARPER IF PROPERLY USED OVER A LONG PERIOD OF TIME

D. IT IS IMPOSSIBLE TO TELL WITHOUT TRYING IT OUT.

OR

E. I DON'T KNOW.

THIS IS THE LAST PROBLEM IN THIS BOOKLET. (Collect booklets.)

BEST COPY AVAILABLE

Directions for Booklet IID
(Primary and Intermediate)

(Distribute test booklets and pencils to students. For Kindergarteners enter the requested identification information. Direct older students to complete the identification information.)

TURN TO PAGE 1. FOR THESE QUESTIONS ONE THING IS DIFFERENT IN SOME WAY FROM THE OTHER THREE THINGS. LOOK CAREFULLY AT THE DRAWINGS WHILE I READ THE QUESTION. THEN MARK YOUR ANSWER. MARK THE ONE THAT IS DIFFERENT.

(When administering the Primary version read aloud questions 1-5. Read each item twice. When administering the Intermediate version read aloud questions 1-5 once. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to see that all the students are on the right page.)

PROBLEM 1. BELOW ARE FOUR THINGS. PUT AN X ON THE ONE THAT IS DIFFERENT FROM THE OTHER THREE.

MARK YOUR ANSWER. TURN TO PAGE 2.

PROBLEM 2. BELOW ARE FOUR THINGS. PUT AN X ON THE ONE THAT IS DIFFERENT FROM THE OTHER THREE.

MARK YOUR ANSWER. TURN TO PAGE 3.

PROBLEM 3. BELOW ARE FOUR THINGS. PUT AN X ON THE ONE THAT IS DIFFERENT FROM THE OTHER THREE.

MARK YOUR ANSWER. TURN TO PAGE 4.

PROBLEM 4. BELOW ARE FOUR THINGS. PUT AN X ON THE ONE THAT IS DIFFERENT FROM THE OTHER THREE.

MARK YOUR ANSWER. TURN TO PAGE 5.

PROBLEM 5. BELOW ARE FOUR THINGS. PUT AN X ON THE ONE THAT IS DIFFERENT FROM THE OTHER THREE.

MARK YOUR ANSWER. TURN TO PAGE 6.

****

Primary Instructions for Questions 6-12

NOW YOU ARE TO TELL THE WORD OR PHRASE THAT BEST FITS THE DRAWING OR DRAWINGS THAT ARE TALKED ABOUT IN THE QUESTION. I WILL READ EACH QUESTION AND THE DIFFERENT ANSWERS. YOU ARE TO MARK AN "X" ON THE LETTER OF THE ANSWER WHICH YOU THINK IS RIGHT. WHEN YOU DON'T KNOW THE ANSWER, MARK CHOICE E, "I DON'T KNOW." READY?

(Read questions 6-12. Read each question and the answer choices twice. Pace students through the items. Wait until all students have completed an item before proceeding to the next item. Check to make sure all students are on the right page. For Kindergarten, when two groups of pictures are shown for a picture, point to the group as you read it in the question. Point to each answer choice as you read it aloud.)

****

Intermediate Instruction for Questions 6-12

NOW YOU ARE TO IDENTIFY THE WORD OR PHRASE THAT BEST FITS THE DRAWING OR DRAWINGS INDICATED. MARK AN "X" ON THE LETTER THAT IDENTIFIES THE CORRECT ANSWER. IF YOU DON'T KNOW THE CORRECT ANSWER, MARK AN "X" ON THE LETTER BY "I DON'T KNOW."

(Read questions 6-12 aloud. Read each question and answer choices once. Pace students through the items. Make sure all students have completed an item before proceeding to the next item. Check to see that all students are on the right page.)

****

PROBLEM 6. WHICH ONE NAME BEST FITS ALL OF THE THINGS IN GROUP 1 BUT DOES NOT FIT ALL OF THE THINGS IN GROUP 2?

A. BATTERIES

B. FURNITURE

C. TOOLS

D. MOTORS

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 7.

PROBLEM 7. WHAT IS THE ONE WORD THAT BEST INDICATES WHAT THE ARROW IS POINTING AT?

A. BLADE

B. STICK

C. SLICE

D. HANDLE

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 8.

PROBLEM 8. WHICH ONE NAME BEST FITS ALL OF THE THINGS IN GROUP 1 BUT DOES NOT FIT ALL OF THE THINGS IN GROUP 2?

A. MEASURING TOOLS

B. CUTTING TOOLS

C. TIGHTENING TOOLS

D. WORK TOOLS

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 9.

PROBLEM 9. WHICH ARE THE WORDS THAT BEST INDICATE WHAT THE ARROW IS POINTING AT?

A. SMOOTH BLADE

B. WOODEN HANDLE

C. TOOTHED BLADE

D. SQUARE BLADE

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 10.

PROBLEM 10. WHICH ONE NAME BEST FITS ALL OF THE THINGS IN GROUP 1 BUT DOES NOT FIT ALL OF THE THINGS IN GROUP 2?

A. SANDING TOOLS

B. ELECTRIC TOOLS

C. POWER TOOLS

D. HAND TOOLS

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 11.

PROBLEM 11. WHICH ARE THE WORDS THAT BEST INDICATE WHAT THE ARROW IS POINTING AT?

A. PLAIN HANDLE

B. SMOOTH BLADE

C. TOOTHED BLADE

D. ROUND HANDLE

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. TURN TO PAGE 12.

PROBLEM 12. WHICH OF THE FOLLOWING IS THE DEFINITION OF "CUTTING TOOL?"

A. ANY TOOL THAT IS USED TO ACCOMPLISH WORK.

B. ANY TOOL THAT HAS A SHARP EDGE THAT IS USED TO SHAPE PENETRATE.

C. ANY TOOL THAT IS USED TO MEASURE LENGTHS OR DISTANCES.

D. ANY TOOL THAT HAS A SOLID METAL HEAD AND A WOODEN HANDLE.

OR

E. I DON'T KNOW.

MARK YOUR ANSWER. THIS IS THE LAST PROBLEM. (Collect booklets.)

V

TEST BATTERY

Name _____ Birthdate _____
Last First Middle Month Day Year

School _____ Grade _____ Today's Date _____

Sex F M

Conceptual Learning and Development Assessment Series II (A)

Bernard, M.E., Klausmeier, H.J., and Katzenmeyer, C.G.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

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1

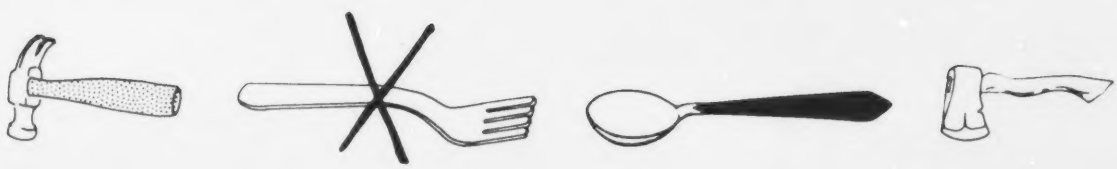
40

A.

Stop

2

A.



Stop

B.

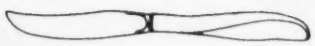
Stop

B.

Stop

5

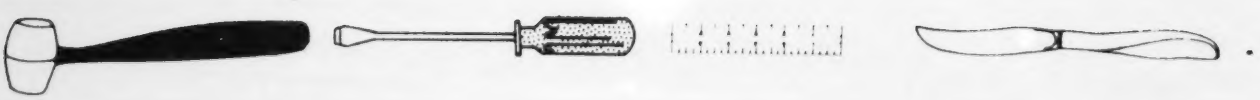
1.a



Stop

6

1.b



Stop

2.a

Stop

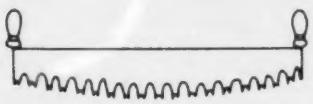
8

2.b

Stop

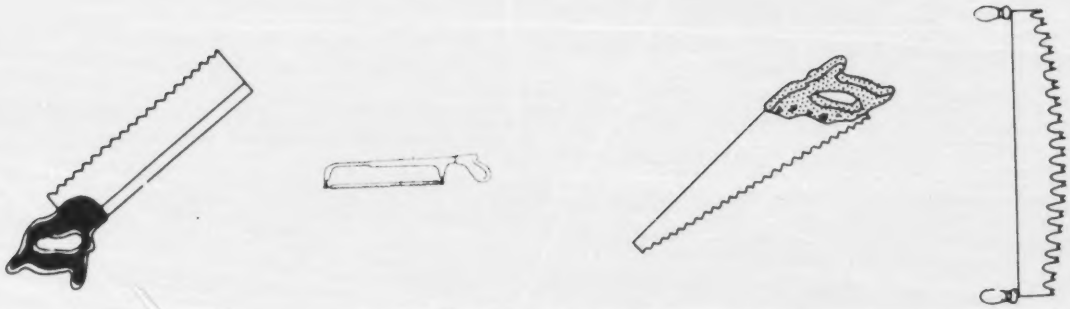
44

3.a



Stop

3.b



Stop

11

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4.a

Stop

12

4.b

Stop

13

5.a

Stop

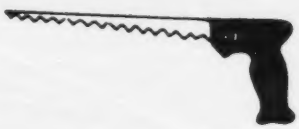
14

5.b

Stop

15

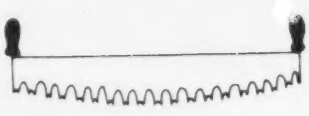
6.a

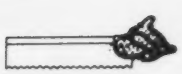


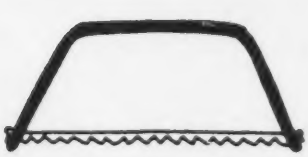
Stop

16

6.b



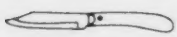




Stop

17

7a.



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18

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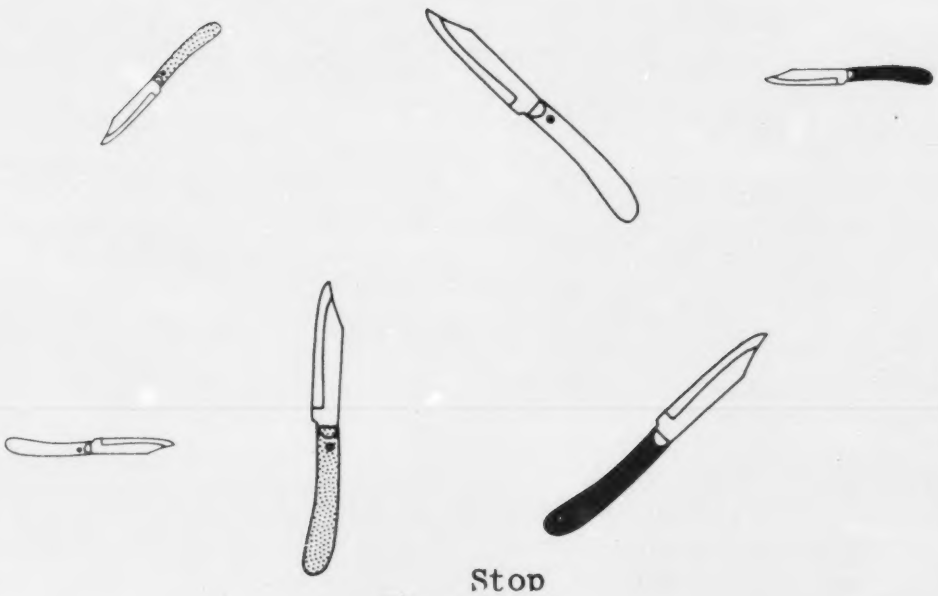


Stop

50

19

8a.

Stop

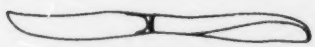
20

8b.

Stop

21

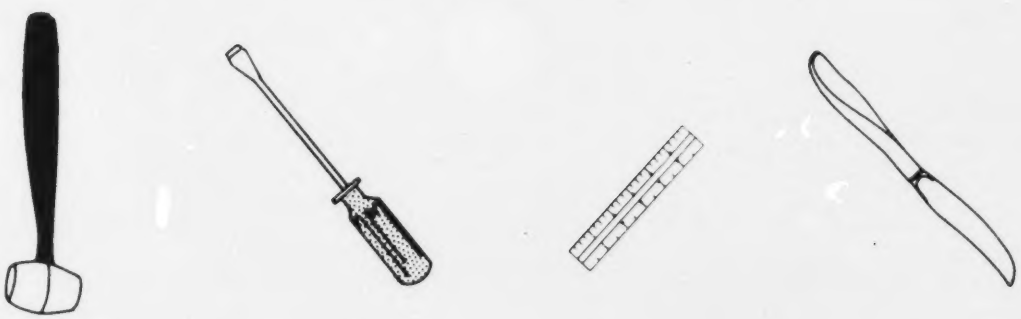
9a.



Stop

22

9b.



Stop

51

10a.

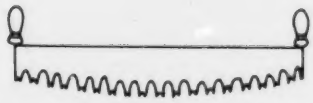
Stop

10b.

Stop

25

11a.



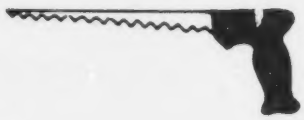
Stop

26

11b.

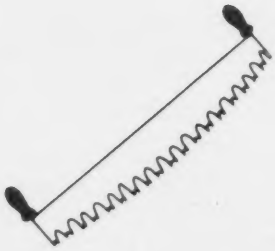
Stop

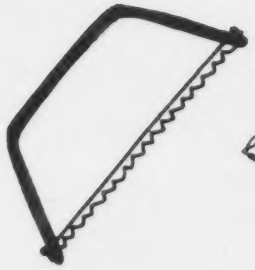
12a.



Stop

12b.





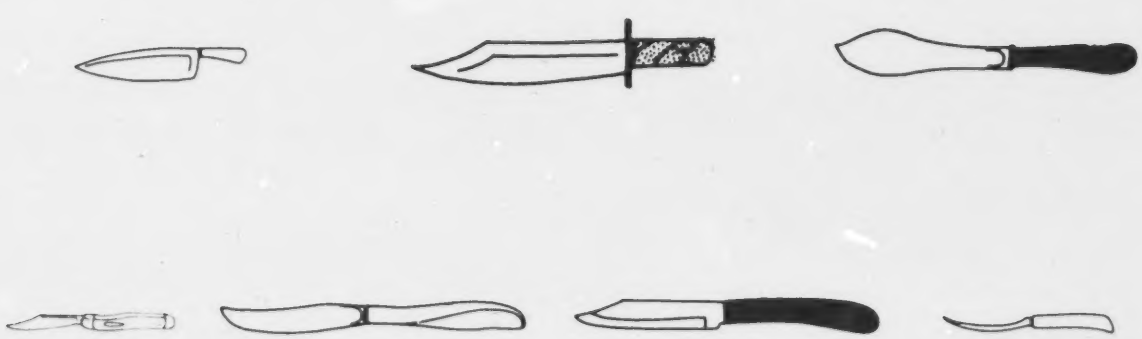
Stop

54

13a.

Stop

13b.



Stop

31

14a.

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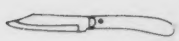
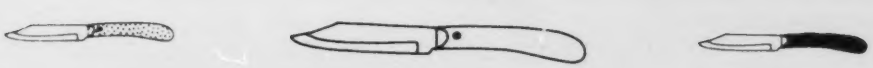
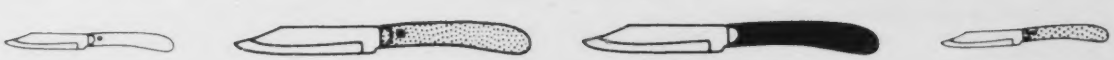


Stop

32

14b.





Stop

Name _____

Conceptual Learning and Development Assessment Series II (B)

Bernard, M.E., Klausmeier, H.J., and Katzenmeyer, C.G.

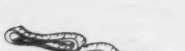
DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

1

A. The thing on the left is used to do certain kinds of work. Put an X on the thing on the right that is used to do the same kind of work as the thing on the left.

2

B. The thing on the left is used to do certain kinds of work. Put an X on the thing on the right that is used to do the same kind of work as the thing on the left.



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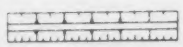
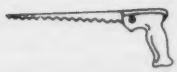
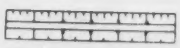
1. The thing on the left is used to do certain kinds of work. Put an X on the thing on the right that is used to do the same kind of work as the thing on the left.

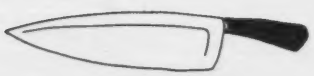
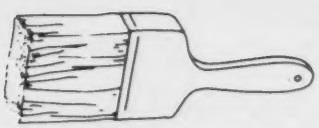


2. The thing on the left is used to do certain kinds of work. Put an X on the thing on the right that is used to do the same kind of work as the thing on the left.

60

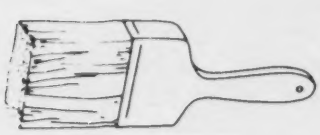
3. Put an X on the things below that are used to do the same kind of work.

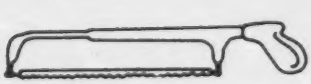



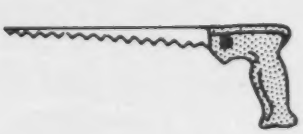



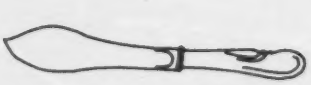
6

4. Put an X on the things below that are used to do the same kind of work.









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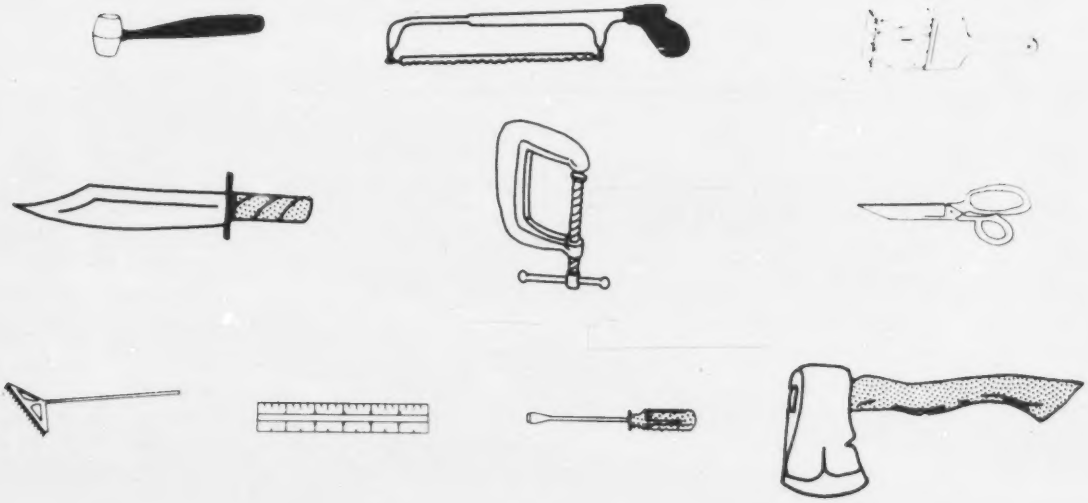
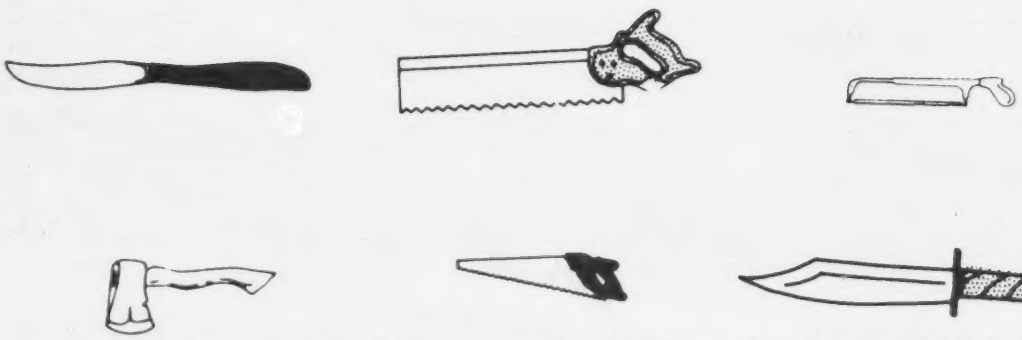
5. Put an X on the things below that are used to do the same kind of work.





6. Look at the things above. Do they all have a blade that is smooth?

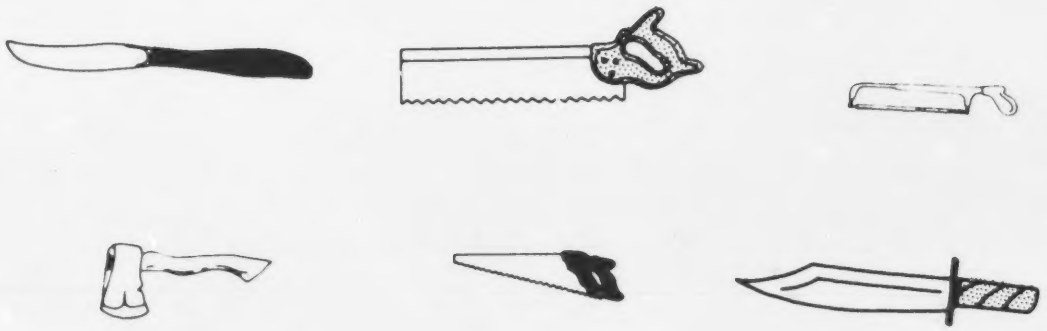
   a. Yes, all of them have a blade that is smooth.

   b. No, only some of them have a blade that is smooth.

   c. No, none of them have a blade that is smooth.

   d. I don't know.

9



7. Look at the things above that have a blade that is smooth. Are they all cutting tools?

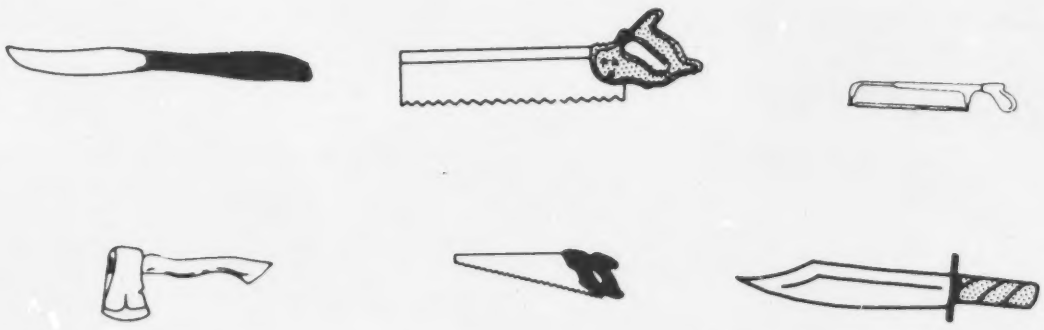
a. Yes, all of them are cutting tools.

b. No, only some of them are cutting tools.

c. No, none of them are cutting tools.

d. I don't know.

10



8. Look at the things above. Do they all have a blade that has teeth?

a. Yes, all of them have a blade that has teeth.

b. No, none of them have a blade that has teeth.

c. No, only some of them have a blade that has teeth.

d. I don't know.

11

9. Look at the things above. Are they all things that cut?

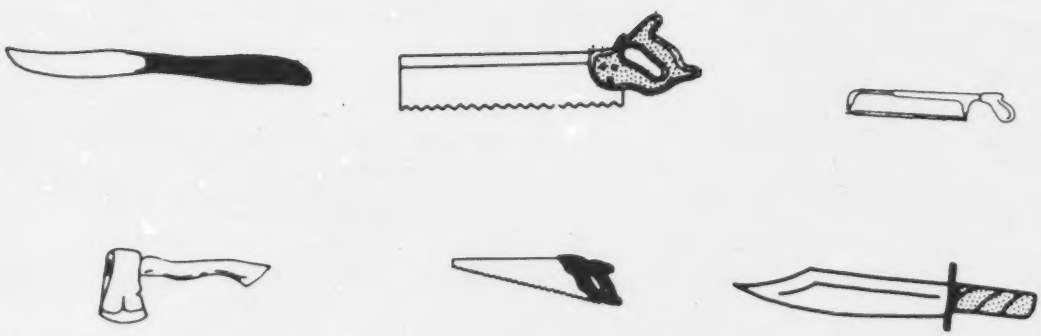
a. No, only some of them cut.

b. Yes, all of them cut.

c. No, none of them cut.

d. I don't know.

12



10. Look at the large things above. Do they all have a blade that is smooth?

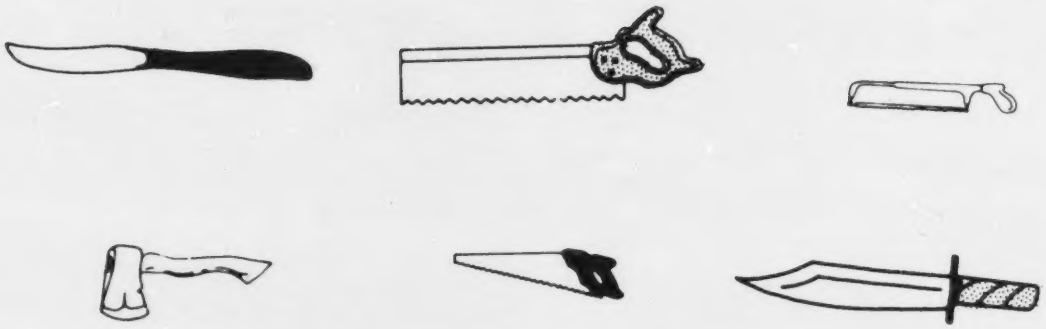
a. Yes, all of them have a blade that is smooth.

b. No, only some of them have a blade that is smooth.

c. No, none of them have a blade that is smooth.

d. I don't know.

13



11. Look at all the things above that have a blade that is smooth and all the things that have a blade that has teeth. If you put them all in a group, there would be _____ there are cutting tools.

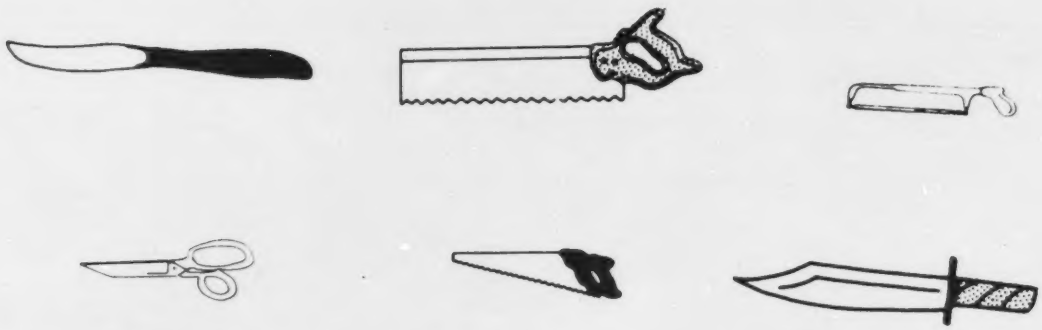
a. fewer of them than

b. more of them than

c. the same amount of them as

d. I don't know.

14



12. Look at the things above that have a blade that has teeth. Are they all cutting tools?

a. Yes, all of them are cutting tools.

b. No, only some of them are cutting tools.

c. No, none of them are cutting tools.

d. I don't know.

15

13. Look at the things above that cut. Are they all tools?

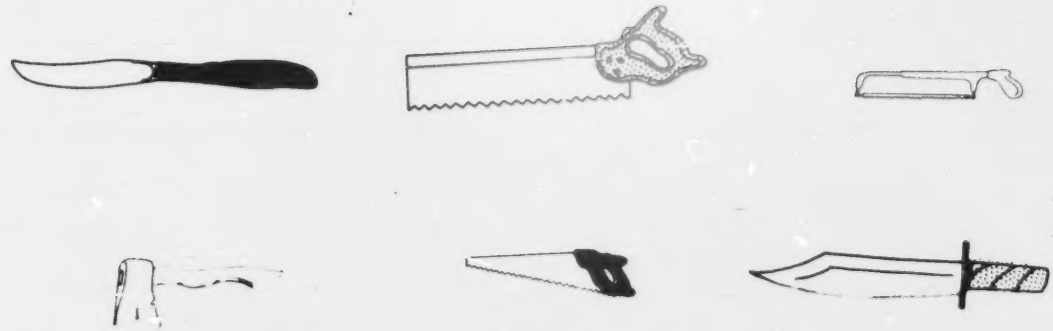
a. Yes, all of them are tools.

b. No, only some of them are tools.

c. No, none of them are tools.

d. I don't know.

16



14. Look at the things above that have a black handle. Do all of them have a blade that has teeth?

a. Yes, all of them have a blade that has teeth.

b. No, only some of them have a blade that has teeth.

c. No, none of them have a blade that has teeth.

d. I don't know.

15. Look at all of things above that cut and all of the things that do not cut. If you put them all in a group, there would be _____ there are tools.

a. fewer of them than

b. more of them than

c. the same amount of them as

d. I don't know.

Name _____

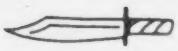
Conceptual Learning and Development Assessment Series II (C)

Bernard, M.E., Klausmeier, H.J., and Katzenmeyer, C.G.

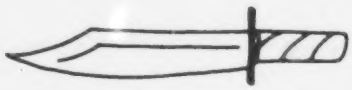
DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

1

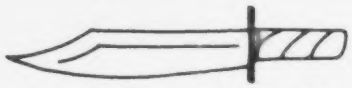
1.



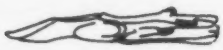
Knife X = 3 inches



Knife Y = 6 inches



Knife Z = 6 inches



Knife X, Knife Y, and Knife Z have sharp blades. Imagine that Knife X is three inches long and can only withstand a small amount of impact. Imagine that Knife Y is six inches long and can withstand a large amount of impact. Imagine that Knife Z is six inches long and can withstand only a small amount of impact.

Which knife should be used to cut through a piece of hard wood if you want to use a knife that will not break?

a. Knife X

b. Knife Y

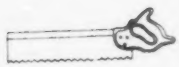
c. Knife Z

d. It is impossible to tell without trying them out.

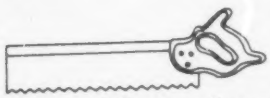
e. I don't know.

2

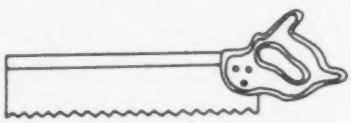
2.



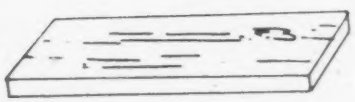
Saw X = 8 inches



Saw Y = 12 inches



Saw Z = 16 inches



Imagine that Saw X has a sharp blade and is eight inches long. Imagine that Saw Y has a sharp blade and is twelve inches long. Imagine that Saw Z has a sharp blade and is sixteen inches long.

Which saw should be used to cut through the large piece of wood most quickly?

a. Saw X

b. Saw Y

c. Saw Z

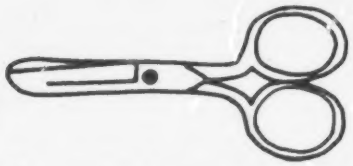
d. It is impossible to tell without trying them out.

e. I don't know.

3.

Scissor X = 4 inches

Scissor Y = 5 inches



Scissor Z = 6 inches

Scissor X, Scissor Y, and Scissor Z have sharp blades. Imagine that Scissor X is four inches long and has a high degree of hardness. Imagine that Scissor Y is five inches long and has a low degree of hardness. Imagine that Scissor Z is six inches long and has a low degree of hardness.

Which scissor should be used if you want a scissor that will stay sharp when cutting many pieces of tough cloth or material?

a. Scissor X

b. Scissor Y

c. Scissor Z

d. It is impossible to tell without trying them out.

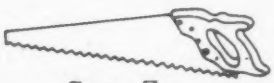
e. I don't know.

4

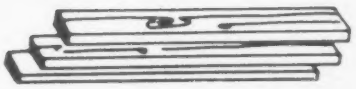
4.

Saw X

Saw Y



Saw Z



Saw X, Saw Y, and Saw Z are exactly alike in size and sharpness. Saw X was tempered at 430 degrees, Saw Y at 520 degrees, and Saw Z at 610 degrees.

Which saw should be used if you want a saw that will not break when cutting through many pieces of hard wood?

a. Saw X

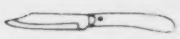
b. Saw Y

c. Saw Z

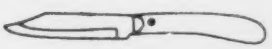
d. It is impossible to tell without trying them out.

e. I don't know.

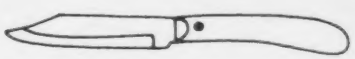
5.



Knife X = 4 inches



Knife Y = 6 inches



Knife Z = 8 inches

Imagine that Knife X has a dull blade and is four inches long. Imagine that Knife Y has a sharp blade and is six inches long. Imagine that Knife Z has a dull blade and is eight inches long.

Which knife should be used to cut through the piece of meat most quickly?

a. Knife X

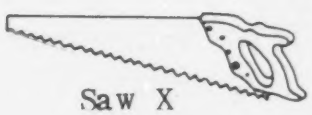
b. Knife Y

c. Knife Z

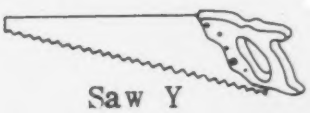
d. It is impossible to tell without trying them out.

e. I don't know.

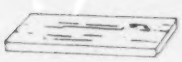
6.



Saw X



Saw Y



Saw X can withstand a larger amount of impact than can Saw Y. When cutting the hard piece of wood, Saw X will break _____ Saw Y.

a. more quickly than

b. as quickly as

c. less quickly than

d. It is impossible to tell without trying them out.

e. I don't know.

7.

Knife X

Knife Y

Knife X is larger than Knife Y. Knife X and Knife Y have equally sharp blades. Knife X will cut through a large piece of meat _____Knife Y.

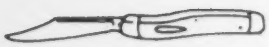
a. more quickly than

b. less quickly than

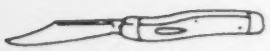
c. as quickly as

d. It is impossible to tell without trying them out.

e. I don't know.

8. 

Knife X



Knife Y

Knife X and Knife Y are equally sharp. Knife X was heated to a higher tempering temperature than was Knife Y. When cutting the hard piece of wood, Knife X is _____ Knife Y.

a. less likely to break than

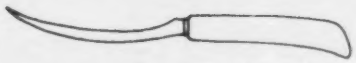
b. equally likely to break as

c. more likely to break than

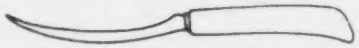
d. It is impossible to tell without trying them out.

e. I don't know.

9

9. 

Knife X



Knife Y

The blade of Knife X is hard and sharp. The blade of Knife Y is hard and dull. Knife X will cut through a piece of meat _____ Knife Y.

a. as quickly as

b. more quickly than

c. less quickly than

d. It is impossible to tell without trying them out.

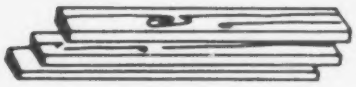
e. I don't know.

10

10.

Saw X

Saw Y



Both Saw X and Saw Y have sharp blades. The blade of Saw X is much harder than is the blade of Saw Y. When cutting through many pieces of hard wood, Saw X will _____ Saw Y.

a. become duller over a longer period of use than

b. remain as sharp over a long period of use as

c. remain sharper over a longer period of use than

d. It is impossible to tell without trying them out.

e. I don't know.

11

11. A cutting tool blade that can withstand a large amount of impact is _____ a cutting tool blade that cannot withstand a large amount of impact.

a. as likely to break as

b. less likely to break than

c. more likely to break than

d. It is impossible to tell without trying them out.

e. I don't know.

12

12. A sharp cutting tool blade cuts _____ a dull cutting tool blade.

a. less quickly than

b. more quickly than

c. as quickly as

d. It is impossible to tell without trying them out.

e. I don't know.

13

13. A large kind of cutting tool accomplishes_____ a small cutting tool of the same kind.

a. a lesser amount of cutting than

b. the same amount of cutting as

c. a greater amount of cutting than

d. It is impossible to tell without trying them out.

e. I don't know.

14

14. A cutting tool blade when heated to a high tempering temperature will _____.

a. be quite likely to break

b. have a sharp blade

c. be likely not to break

d. It is impossible to tell without trying it out.

e. I don't know.

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15. A sharp cutting tool blade that has a high degree of hardness _____.

a. becomes quite dull over a long period of use

b. remains sharp over a long period of use

c. becomes sharper if properly used over a long period of time

d. It is impossible to tell without trying it out.

e. I don't know.

Name _____

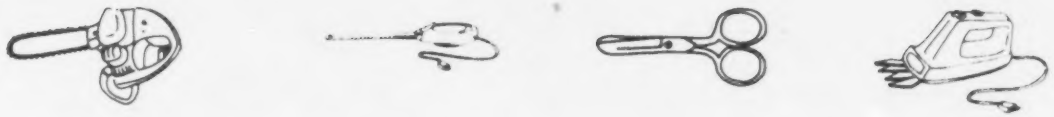
Conceptual Learning and Development Assessment Series II (D)

Bernard, M.E., Klausmeier, H.J., and Katzenmeyer, C.G.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

1

1. Below are four things. Put an X on the one that is different from the other three.



Stop

2

2. Below are four things. Put an X on the one that is different from the other three.

Stop

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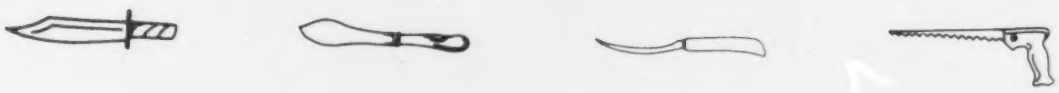
3. Below are four things. Put an X on the one that is different from the other three.



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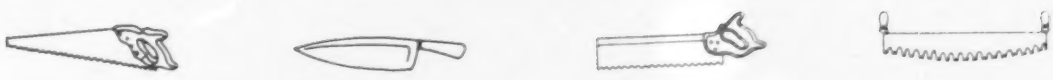
4

4. Below are four things. Put an X on the one that is different from the other three.



Stop

5. Below are four things. Put an X on the one that is different from the other three.

Stop

6.

Group 1

Group 2

Which one name best fits all of the things in Group 1 but does not fit all of the things in Group 2?

a. batteries

b. furniture

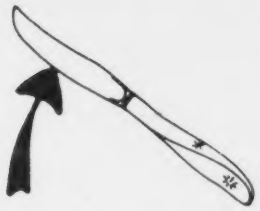
c. tools

d. motors

e. I don't know

Stop

7.



What is the one word that best indicates what the arrow is pointing at?

a. blade

b. stick

c. slice

d. handle

e. I don't know

Stop

8.

Group 1

Group 2

Which one name best fits all of the things in Group 1 but does not fit all of the things in Group 2?

a. measuring tools

b. cutting tools

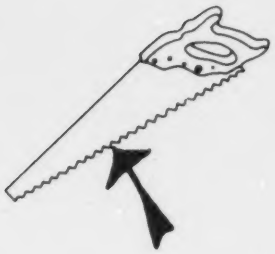
c. tightening tools

d. work tools

e. I don't know

Stop

9.



Which are the words that best indicate what the arrow is pointing at?

a. smooth blade

b. wooden handle

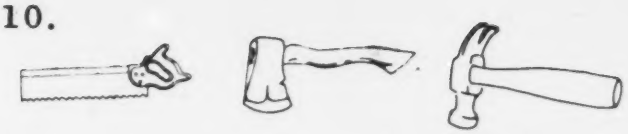
c. toothed blade

d. square handle

e. I don't know

Stop

10.



Group 1

Group 2

Which one name best fits all of the things in Group 1 but does not fit all of the things in Group 2?

a. sanding tools

b. electric tools

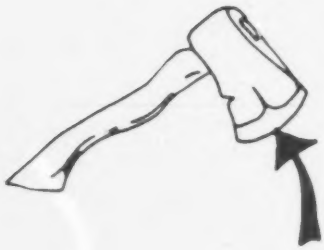
c. power tools

d. hand tools

e. I don't know

Stop

11.



Which are the words that best indicate what the arrow is pointing at?

a. plain handle

b. smooth blade

c. toothed blade

d. round handle

e. I don't know

Stop

12

12. Which of the following is the definition of "cutting tool"?

a. any tool that is used to accomplish work

b. any tool that has a sharp edge that is used to shape or penetrate

c. any tool that is used to measure lengths or distances

d. any tool that has a solid metal head and a wooden handle

e. I don't know

Stop

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